### **Driver Education Classroom And In-car Instruction**

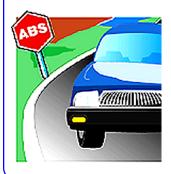
**Driving Procedures Unit** 

Anti-lock Brakes Topic One

Electronic Stability Control Systems Topic Two

**Suggested Lessons** 

## GRADE HS







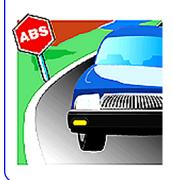
### **Driver Education Classroom And In-car Instruction**

**Driving Procedures Unit** 

Anti-lock Brakes Topic One

**Suggested Lesson** 

## GRADE HS





### **Acknowledgments**

The ABS Education Alliance is the industry's first coordinated effort to inform the public about the proper use and benefits of anti-lock brakes. "America Brakes for Safety" is the name of the Alliance's educational campaign geared toward consumers and the automotive, insurance and driver education industries.

The ABS Education Alliance is a coalition of three companies that represent anti-lock brake manufacturers in the United States: Robert Bosch Corporation, Continental TEVES, and Delphi Automotive. The Alliance Trustees oversee full implementation of the organization's goals and are actively seeking additional partners and participants in an educational campaign.

In partnership with ADTSEA and Safe T Associates, the ABS Education Alliance developed this curriculum for driver education instructors specifically to teach the fundamentals of the ABS and other safety technologies in a classroom and laboratory setting. For more information about the curriculum or to obtain additional copies, please visit the ABS Education Alliance website, www.abseducation.org.

### Note:

Topic One — Anti-Lock Brakes — was developed in 1998.

Topic Two — Electronic stability control — was developed in 2001.

The composition of the Alliance has changed, but the content of this curriculum remains accurate.



## Driving Procedures: Adverse Conditions TOPIC ONE USING AN ANTI-LOCK BRAKE SYSTEM EFFECTIVELY

Page	Topic Area	Materials Needed	
5	Overview	ABS Pretest	
5	Introduction	Transparency ABS-1	
6	Traction	Transparency ABS-2 & 3	
7	ABS Advantages	Transparency ABS-4	
10	ABS Video	"Benefits of Four-wheel Anti-lock	
		Braking Systems"	
10	ABS Concerns	Worksheet ABS-A	
		"America Brakes for Safety"	
11	<b>ABS Issues</b>	Transparency ABS-5	
12		Transparency ABS-6	
13	<b>ABS Summary</b>	"America Brakes for Safety"	
14	Assessments	<b>Topic Evaluation</b>	
20	Performance Skill Activi	ity 1-1	

### **RESOURCES/MATERIALS**

15	Evaluation	ABS Pretest
16	Evaluation	ABS Topic Assessment
17	Evaluation	<b>ABS Assessment Answer Sheet</b>
19	Worksheet ABS-A	"ABS Concerns and Issues"
20	Performance Skill Activity 1-1	"Squeeze Braking, Limited Steering,
		and ABS"
42	Transparency ABS-1	"ABS Transparency Objectives"
43	Transparency ABS-2	"ABS Development"
44	Transparency ABS-3	"Traction Depends On:"
45	Transparency ABS-4	"ABS Advantages"
46	Transparency ABS-5	"With Anti-lock Braking Systems, Do:"
47	Transparency ABS-6	"With Anti-lock Braking Systems,
		Do Not:"

The student will be able to:

- name two ways that a driver may deactivate ABS without realizing it.
- explain the difference between 4-wheel and 2-wheel ARS
- demonstrate an appropriate response to ABS in operation.

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **CONTENT/ACTIVITIES**

### **Anti-lock Brakes Make Sense**

**OVERVIEW.** Maintaining control of your vehicle is a key to safe driving. The traction between your rolling tires and the road surface will impact the amount of control you have in a given situation. Braking—whether slowing for a turn or braking for a stop—can cause a car to lose rolling traction. This can affect stopping distance and steering control. Anti-lock brake system (ABS) technology has become available to maintain rolling traction, offering skidfree stopping and steering control.

ABS allows the driver to steer his/her vehicle out of potentially damaging situations. The anti-lock brake system is engaged only under potentially dangerous conditions and engages when it detects impending wheel lock. ABS is not engaged under normal braking conditions and it will not impair normal braking actions. The following information is intended for 4-wheel ABS except where noted otherwise.

**Introduction.** The instructor should use the attached pretest to provide a basis for novice driver entry knowledge of this topic area (see page 14). Show Transparency ABS-1 to provide overview and Transparency ABS-2 to provide background information for ABS development (see page 21).

Use the following questions to initiate discussion about the development of an anti-lock brake system:

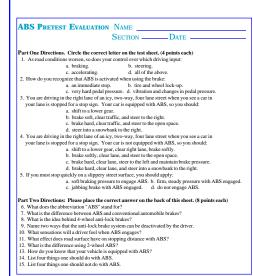
• When was the technology available?

(An anti-lock brake system, which prevents wheel lock-up during braking, was first patented for passenger car application in the 1930s.)

On what type of vehicle was the first application of ABS

### **RESOURCES/MATERIALS**

### **ABS Pretest**



### **Transparency ABS-1**



ABS EDUCATION ALLIANCE

### **Driver Education Classroom And In-car Instruction**

**Performance Knowledge and Skills** 

The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.

### **CONTENT/ACTIVITIES**

technology used?

(ABS was first introduced in the 1930s for use on aircraft.)

• When did ABS become readily available for passenger vehicles?

(Interest in developing ABS for production automobiles emerged at about the same time as that for aviation. Several suppliers became interested in ABS, but interest waned and research was discontinued for several years. In the 1980s, interest was renewed as many vehicle safety technologies were developed for use in passenger vehicles.)

• What road vehicles were first required users of ABS technology?

(ABS regulations for heavy duty trucks were first introduced in the United States (1975-76) to reduce crashes due to traction loss. This technology advancement allowed for fewer jackknifing situations due to brake traction losses. The mandate was revoked, then reinstated in early 1997.)

**TRACTION.** When drivers use improper braking, steering, or acceleration techniques, a vehicle can lose traction. Use Transparency ABS-3 to review the conditions that contribute to increasing or decreasing a stopping distance (see page 22). In other parts of the curriculum, students should have discussed road surface, weather conditions, tires, braking techniques, and speed as potential problem areas.

Now it is time to consider braking as a potential to

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **RESOURCES/MATERIALS**

**Transparency ABS-2** 



### **Transparency ABS-3**



The student will be able to:

- name two ways that a driver may deactivate ABS without realizing it.
- explain the difference between 4-wheel and 2-wheel ARS.
- demonstrate an appropriate response to ABS in operation.

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **CONTENT/ACTIVITIES**

increase or decrease stopping distance based on braking principles and techniques. There are several appropriate techniques to brake a modern automobile. Drivers must understand that locking the wheels is dangerous because wheels stop rolling, tires lose traction, stopping distance may increase, and steering ability is lost.

**ABS ADVANTAGES.** On most roadway surfaces, ABS controls the brakes better than driver "pumping" or "jabbing" techniques. Use Transparency ABS-4 to identify the four advantages of ABS technology (see page 23).

ENHANCED BRAKING ACTION. With the advent of caliper-disc brake technology in the late 1960s, drivers were discouraged from using pumping brake actions. Instead, they were encouraged to use squeeze braking techniques, similar to the process used on a hand brake bicycle, to slow the vehicle. Transparency ABS-4 may be used to illustrate the ABS advantages (see page 23).

Due to the difficulty in applying the squeeze braking techniques, drivers tended to lock the wheels causing the tires to skid. ABS was developed to assist driver braking actions when impending wheel lock-up could occur. Advances in computer and sensory technology allowed ABS to become a practical feature.

In some reduced traction situations when wheel lockup occurred, drivers were trained to use jab-braking actions to enhance steerability and reduce stopping dis-

### **RESOURCES/MATERIALS**

### **Transparency ABS-4**

# ABS Advantages • Enhanced Braking Action • Vehicle Steerability • Vehicle Stability • Stopping Distance





### **Driver Education Classroom And In-car Instruction**

**Performance Knowledge and Skills** 

The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.

### **CONTENT/ACTIVITIES**

tance. ABS allows this braking action to occur in a more efficient manner by providing the jabbing action automatically while the driver maintains steady brake pressure.

**VEHICLE STEERABILITY.** Steerability refers to the ability to move the vehicle where the driver wants it to go. With rolling traction, a driver is able to steer the car from 12 to 14 feet (lane width) to the right or left in a lane change or make a smooth adjustment when entering a curve. In each of these driving situations, sudden steering actions can cause a sudden shift in vehicle balance and traction loss. This lack of steerability may take the vehicle off the normal traveled section of the roadway.

On limited traction surfaces, under driver panic conditions and where limited steering actions are required, ABS technology will enhance driver control capabilities. ABS technology is designed to maintain rolling traction and steering. The rolling action may produce longer stopping distances on some dry surfaces and limited traction surfaces, such as freshly fallen snow or loose gravel. The ABS steering advantage outweighs any braking disadvantage on any of these surfaces. Evasive steering techniques are designed to allow the driver to steer the vehicle clear of danger.

By maintaining a speed reduction without wheel lockup, ABS increases steerability of the vehicle. The driver should use just enough steering movement to adjust the vehicle to a clear space on the roadway. It is important to emphasize looking where they want to steer the vehicle in order to avoid an obstacle. Too much steering movement may take the car off the roadway. The driver must recognize that the ABS system does not influence normal brakTOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **RESOURCES/MATERIALS**

### **Transparency ABS-4**

# ABS Advantages • Enhanced Braking Action • Vehicle Steerability • Vehicle Stability • Stopping Distance

**Topic Goal:** To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.

The student will be able to:

- name two ways that a driver may deactivate ABS without realizing it.
- explain the difference between 4-wheel and 2-wheel ARS.
- demonstrate an appropriate response to ABS in operation.

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **CONTENT/ACTIVITIES**

ing operations, and the driver has the responsibility to maintain a safe following time or distance interval.

**VEHICLE STABILITY.** The vehicle stability concept refers to maintaining a vehicle's tire traction on the roadway surface. Current traction control principles, with conventional brakes, ask the driver to remove the foot from the brake or accelerator when traction is lost in order to regain vehicle stability. Simply stated, when too much braking is applied to the vehicle, the tires lose traction with the road surface. The driver releases brake pressure to allow wheel movement. ABS allows the wheels to roll while the driver maintains full brake pressure on the brake pedal. The rolling action helps to regain traction control (stability) to the front or rear tires.

**STOPPING DISTANCE.** Stopping distance is **generally** reduced by ABS technology. Training a driver using conventional brakes on limited traction surfaces often called for a braking technique designated as **jabbing** the brake. This fast application of full braking on and full release off was designed to enhance steerability and stability of the vehicle and reduce the stopping distance. ABS technology is designed to perform this jabbing the brake technique automatically, using computer wheel speed sensors with more efficiency than a driver can apply the process. This action allows the technology to perform the braking action while the driver maintains a constant firm pressure on the brake pedal and concentrates on finding an open lane steering option.

ABS VIDEO. Use the video entitled "Benefits of Four-

### **RESOURCES/MATERIALS**

**Transparency ABS-4** 

## • Enhanced Braking Action • Vehicle Steerability • Vehicle Stability • Stopping Distance

Reference: ABS Education Alliance. (1997). America Brakes for Safety. An illustrated brochure.



### **Driver Education Classroom And In-car Instruction**

**Performance Knowledge and Skills** 

The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.

### **CONTENT/ACTIVITIES**

wheel Anti-lock Braking Systems" to demonstrate the significance of enhanced vehicle stability, steerability, and reduced stopping distance. The video will provide examples of poor driving and braking techniques and follow up with the advantages of four-wheel ABS. The technology will be explained and examples of the technology at work will be displayed. The video will mention the increased ability to stop the car on most surfaces, but the primary issue is the increased vehicle stability and the ability to steer the vehicle out of harm's way.

**ABS CONCERNS.** Use Worksheet ABS-A (see page 18) to identify student knowledge of concerns presented by the ABS industry regarding incorrect use of the technology. Hand out the pamphlet entitled "America Brakes for Safety" sponsored by the ABS Education Alliance to aid in answering the questions on the student worksheet. (If time permits, this may be completed as a class activity, or used as a homework assignment with a follow up discussion.)

**ABS Issues**. A discussion of ABS issues should follow the worksheet completion and include the following items:

What does the abbreviation "ABS" stand for?

[The abbreviation stands for Anti-lock Brake System (see page 4, Curriculum; Outside Cover, Pamphlet)].

 What is the difference between ABS and conventional automobile brakes?

[Conventional brakes allow wheels to be locked by the

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **RESOURCES/MATERIALS**



### "Benefits of Four-wheel Anti-lock Braking Systems" 6-1/2 min.

(English and Spanish closed caption tapes available)

produced by ABS Education Alliance www.abs-education.org



### **Worksheet ABS-A**

WORKSHEET ABS-A "ABS	S CONCERNS AND ISSUES"
Class Activity 1-1 DRIVING UNDER	ADVERSE CONDITIONS
Name	Date
Answer the following questions to the be pamphlet provided by the ABS Education	est of your ability using the "America Brakes for Safety" a Alliance.
What does the abbreviation "ABS"	stand for?
What is the difference between ABS	and conventional automobile brakes?
What is the idea behind anti-lock be	rakes?
Name two ways that the anti-lock by by the driver.	rake system can be inadvertently disengaged
What sensations will a driver feel w	hen ABS is engaged?
What surfaces may produce a longer	er stopping distance with ABS?
What is the difference using 2-whee	d ABS?
How do you know that your vehicle	is equipped with ABS?
· List four things one should do with	ABS.
List four things one should not do w	vith ABS.

The student will be able to:

- name two ways that a driver may deactivate ABS without realizing it.
- explain the difference between 4-wheel and 2-wheel ARS.
- demonstrate an appropriate response to ABS in operation.

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **CONTENT/ACTIVITIES**

driver and produce a loss of rolling traction. ABS engages when a wheel speed sensor detects impending wheel lock-up, allowing the vehicle to be steered while helping maintain vehicle stability (see page 6, Curriculum; Inside Column 4, Pamphlet)].

What is the idea behind 4-wheel anti-lock brakes?

[4-wheel is designed to prevent skidding and maintain limited steering control during emergency braking (see page 7, Curriculum; Cover, Pamphlet)].

• Name two ways that the anti-lock brake system can be deactivated by the driver.

[By removing the hard pressure from the brake pedal or by pumping the brakes (Inside Column 1, Pamphlet)].

• What sensations will a driver feel when ABS engages? [Brakes may feel harder to push, have a vibration, or noises may occur (see page 11, Curriculum; Inside Column 1, Pamphlet)].

• What effect does road surface have on stopping distance with ABS?

[Stopping distance may be longer on some dry surfaces and limited traction surfaces, such as freshly fallen snow or loose gravel, but the ability to steer the vehicle remains (see page 7, Curriculum; Inside Column 1-2, Pamphlet)].

• What is the difference using 2-wheel ABS?

[2-wheel ABS, found only on light trucks, is designed to eliminate rear wheel skid which may produce a loss of

### **RESOURCES/MATERIALS**



pamphlet available at

ABS Education Alliance

www.abseducation.org

Robert Bosch Corp.

Continental TEVES

Delphi Automotive Systems

### **Worksheet ABS-A**

WORKSHEET ABS-A "ABS CONCERNS AND ISSUES"
Class Activity 1-1 DRIVING UNDER ADVERSE CONDITIONS
Name Date
Answer the following questions to the best of your ability using the "America Brakes for Safety" pamphlet provided by the ABS Education Alliance.
What does the abbreviation "ABS" stand for?
$\bullet \ What is the difference between ABS and conventional automobile brakes?$
What is the idea behind anti-lock brakes?
- Name two ways that the anti-lock brake system can be inadvertently disengaged by the driver.
What sensations will a driver feel when ABS is engaged?
What surfaces may produce a longer stopping distance with ABS?
What is the difference using 2-wheel ABS?
How do you know that your vehicle is equipped with ABS?
List four things one should do with ABS.
List four things one should not do with ABS.

Reference: ABS Education Alliance. (1997). America Brakes for Safety. An illustrated brochure.



### **Driver Education Classroom And In-car Instruction**

**Performance Knowledge and Skills** 

The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.

### **CONTENT/ACTIVITIES**

vehicle stability such as a sudden movement to the right or left. The front wheels may still lock up. The driver must recognize that although the vehicle has 2-wheel ABS on the rear wheels, he/she must use conventional braking techniques with this 2-wheel anti-lock brake system (see Inside Column 4, Pamphlet)].

 How do you know that your vehicle is equipped with ABS?

[There may be a marking on the vehicle, but ABS-equipped cars have a dashboard alert system that lights briefly at start-up (Inside Column 1-2, Pamphlet)].

· List four things one should do with ABS.

[Add to your following time or distance interval in poor weather as with conventional brakes, practice using ABS, keep your foot firmly on brake, and check the owner's manual for special concerns (see Transparency ABS-5, p. 24; Inside Column 2, Pamphlet)].

List four things one should not do with ABS.

[Don't drive more aggressively, don't pump the brakes, don't forget to steer after checking for clearance, and don't be alarmed by noise and vibration which may occur (see Transparency ABS-6, p. 25; Inside Column 3, Pamphlet)].

**ABS SUMMARY**. The keys to proper use of the ABS technology are to recognize how the vehicle is equipped, recognize when ABS is functioning, and perform techniques of firm braking and limited

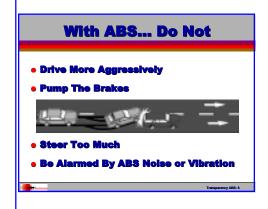
TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **RESOURCES/MATERIALS**

**Transparency ABS-5** 

## • Add to your following distance in bad weather • Practice use of ABS • Keep your foot firmly on the brake • Check owner's manual for special concerns

**Transparency ABS-6** 



The student will be able to:

- name two ways that a driver may deactivate ABS without realizing it.
- explain the difference between 4-wheel and 2-wheel ARS.
- demonstrate an appropriate response to ABS in operation.

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **CONTENT/ACTIVITIES**

steering. Knowing these key factors and elements will allow the driver to take full advantage of this braking technology. The instructor should emphasize that ABS technology does not affect the normal operation of the conventional braking system in any manner. The vehicle's brakes will feel and operate like a conventional system until any impending wheel lock occurs to activate the ABS system.

### SESSION ASSESSMENT

The evaluation pages contain a pretest evaluation as well as assessments that may be used as a topic quiz or part of a unit evaluation.

### **Activities:**

• Students will use reading and comprehension skills to complete Worksheet ABS-A, while reading a pamphlet entitled "America Brakes for Safety" from the ABS Edu-

### **RESOURCES/MATERIALS**

**Transparency ABS-6** 

### With ABS... Do Not

- Drive More Aggressively
- Pump The Brakes



- Steer Too Much
- Be Alarmed By ABS Noise or Vibration

Transparency ABS-



pamphlet available at

ABS Education Alliance

www.abseducation.org

Robert Bosch Corp.

Continental TEVES

Delphi Automotive Systems

**Reference:** ABS Education Alliance. (1997). **America Brakes for Safety.** An illustrated brochure.



### **Driver Education Classroom And In-car Instruction**

**Performance Knowledge and Skills** 

The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.

TOPIC ONE
USING AN ANTI-LOCK BRAKE
SYSTEM EFFECTIVELY
GRADE HS
(45 min.)

### **ASSESSMENT ACTIVITIES**

### **RESOURCES/MATERIALS**

cation Alliance.

• Students will demonstrate knowledge skills by improving pretest to posttest skills

Note: The instructor may determine percentage of knowledge gain by subtracting pretest score from post-test score and dividing that score by the pretest score. Example: Pretest = 45; Posttest = 81 then,

81-45 = 36: 36/45 = 80% (gain) Pretest = 70; Posttest = 72 then, 72-70 = 2: 2/70 = 2.8% (gain)

### **Performance Indicators:**

- Students will be asked to demonstrate skills of ABS operation in the attached in-car lesson objectives.
- Students will share worksheet, pamphlet information, and performance skills with parents.

### Worksheet ABS-A

Class Activity 1-1 DRIVING UNI	DER ADVERSE CONDITIONS
Name	Date
Answer the following questions to pamphlet provided by the ABS Edu	the best of your ability using the "America Brakes for Safet acation Alliance.
What does the abbreviation "A	ABS" stand for?
What is the difference between	ABS and conventional automobile brakes?
What is the idea behind anti-le	ock brakes?
<ul> <li>Name two ways that the anti-le by the driver.</li> </ul>	ock brake system can be inadvertently disengaged
What sensations will a driver to	feel when ABS is engaged?
What surfaces may produce a	longer stopping distance with ABS?
What is the difference using 2-	-wheel ABS?
How do you know that your ve	chicle is equipped with ABS?
List four things one should do	with ABS.
List four things one should no	t do with ABS.

### **Topic Evaluation**

ABS TOPIC EVALUATION	Name _		
	SECTION	Date	
Part One Directions. Circle the correc			
<ol> <li>As road conditions worsen, so does yo</li> </ol>			
a. braking.	b. steen		
c. accelerating.		the above.	
2. How do you recognize that ABS is act			
a. an immediate ste		nd wheel lock-up.	
		ion and changes in pedal pres	
3. You are driving in the right lane of an			rin
your lane is stopped for a stop sign. Y		with ABS, so you should:	
a. shift to a lower g			
b. brake soft, clear			
c. brake hard, clear		the open space.	
d. steer into a snow			
<ol> <li>You are driving in the right lane of an</li> </ol>			
your lane is stopped for a stop sign. Y			:
a. shift to a lower g			
b. brake softly, cle			
		ft and maintain brake pressu	re.
		a snowbank to the right.	
<ol><li>If you must stop quickly on a slippery</li></ol>			
		<ol><li>b. firm, steady pressure w</li></ol>	ith ABS engaged
c. jabbing brake w	ith ABS engaged.	d. do not engage ABS.	
Part Two Directions: Please place the		the back of this sheet. (8 pe	ints each)
<ol><li>What does the abbreviation "ABS" st</li></ol>			
7. What is the difference between ABS a		tomobile brakes?	
<ol><li>What is the idea behind 4-wheel anti-</li></ol>			
9. Name two ways that the anti-lock brai		activated by the driver.	
10. What sensations will a driver feel who		'd 47000	
11. What effect does road surface have or		with AB5?	
12. What is the difference using 2-wheel		co.	
<ol> <li>How do you know that your vehicle is</li> <li>List four things one should do with A</li> </ol>		3!	
<ol> <li>List four things one should do with A</li> <li>List four things one should not do wit</li> </ol>			

ABS Pretest Evaluation	Name		
	Section	Date	

### Part One Directions. Circle the correct letter on the test sheet. (4 points each)

- 1. As road conditions worsen, so does your control over which driving input:
  - a. braking.

b. steering.

c. accelerating.

- d. all of the above.
- 2. How do you recognize that ABS is activated when using the brake:
  - a. an immediate stop.
- b. tire and wheel lock-up.
- c. very hard pedal pressure.
- d. vibration and changes in pedal pressure.
- 3. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
  - a. shift to a lower gear.
  - b. brake soft, clear traffic, and steer to the right.
  - c. brake hard, clear traffic, and steer to the open space.
  - d. steer into a snowbank to the right.
- 4. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
  - a. shift to a lower gear, clear right lane, brake softly.
  - b. brake softly, clear lane, and steer to the open space.
  - c. brake hard, clear lane, steer to the left and maintain brake pressure.
  - d. brake hard, clear lane, and steer into a snowbank to the right.
- 5. If you must stop quickly on a slippery street surface, you should apply:
  - a. soft braking pressure to engage ABS.
- b. firm, steady pressure with ABS engaged.
- c. jabbing brake with ABS engaged.
- d. do not engage ABS.

### Part Two Directions: Please place the correct answer on the back of this sheet. (8 points each)

- 6. What does the abbreviation "ABS" stand for?
- 7. What is the difference between ABS and conventional automobile brakes?
- 8. What is the idea behind 4-wheel anti-lock brakes?
- 9. Name two ways that the anti-lock brake system can be deactivated by the driver.
- 10. What sensations will a driver feel when ABS engages?
- 11. What effect does road surface have on stopping distance with ABS?
- 12. What is the difference using 2-wheel ABS?
- 13. How do you know that your vehicle is equipped with ABS?
- 14. List four things one should do with ABS.
- 15. List four things one should not do with ABS.

ABS Topic Assessment	Name		
ADS Topic Assessment	Section	Date	

### Part One Directions. Circle the correct letter on the test sheet. (4 points each)

- 1. As road conditions worsen, so does your control over which driving input:
  - a. braking.

b. steering.

c. accelerating.

- d. all of the above.
- 2. How do you recognize that ABS is activated when using the brake:
  - a. an immediate stop.
- b. tire and wheel lock-up.
- c. very hard pedal pressure.
- d. vibration and changes in pedal pressure.
- 3. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
  - a. shift to a lower gear.
  - b. brake soft, clear traffic, and steer to the right.
  - c. brake hard, clear traffic, and steer to the open space.
  - d. steer into a snowbank to the right.
- 4. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
  - a. shift to a lower gear, clear right lane, brake softly.
  - b. brake softly, clear lane, and steer to the open space.
  - c. brake hard, clear lane, steer to the left and maintain brake pressure.
  - d. brake hard, clear lane, and steer into a snowbank to the right.
- 5. If you must stop quickly on a slippery street surface, you should apply:
  - a. soft braking pressure to engage ABS.
- b. firm, steady pressure with ABS engaged.
- c. jabbing brake with ABS engaged.
- d. do not engage ABS.

### Part Two Directions: Please place the correct answer on the back of this sheet. (8 points each)

- 6. What does the abbreviation "ABS" stand for?
- 7. What is the difference between ABS and conventional automobile brakes?
- 8. What is the idea behind 4-wheel anti-lock brakes?
- 9. Name two ways that the anti-lock brake system can be deactivated by the driver.
- 10. What sensations will a driver feel when ABS engages?
- 11. What effect does road surface have on stopping distance with ABS?
- 12. What is the difference using 2-wheel ABS?
- 13. How do you know that your vehicle is equipped with ABS?
- 14. List four things one should do with ABS.
- 15. List four things one should not do with ABS.

Driving Unit ABS Topic Sample Evaluation	Name		
	Section	Date	

Part One: Directions. Please place the correct letter on the answer sheet provided.

- As road conditions worsen, so does your control over which driving input:
  - a. braking. b. steering.
  - c. accelerating. d. all of the above.\* (Curriculum, p. 5)
- How do you recognize that ABS is activated when using the brake:
  - a. an immediate stop.
- b. tire and wheel lock-up.
- c. very hard pedal pressure.
- d. vibration and changes in pedal pressure.\*

(Curriculum, p. 12)

- You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
  - a. shift to a lower gear.
  - b. brake soft, clear traffic, and steer to the right.
  - c. brake hard, clear traffic, and steer to the open space.\* (Curriculum, p. 7)
  - d. steer into a snowbank to the right.
- You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
  - a. shift to a lower gear, clear right lane, brake softly.
  - b. brake softly, clear lane, and steer to the open space.\* (Curriculum, p. 7)
  - c. brake hard, clear lane, steer to the left and maintain brake pressure.
  - d. brake hard, clear lane, and steer into a snowbank to the right.
- If you must stop quickly on a slippery street surface, you should apply:
  - a. soft braking pressure to engage ABS.
  - b. firm, steady pressure with ABS engaged.\* (Curriculum. p. 8)
  - c. jabbing brake with ABS engaged.
  - d. do not engage ABS.

### Part Two: Directions. Please place the correct answer on the answer sheet provided.

What does the abbreviation "ABS" stand for?

[The abbreviation stands for Anti-lock Brake System (see page 4, Curriculum; Outside Cover, Pamphlet)].

What is the difference between ABS and conventional automobile brakes?

[CONVENTIONAL BRAKES ALLOW WHEELS TO BE LOCKED BY THE DRIVER AND PRODUCE A LOSS OF ROLLING TRACTION. ABS ENGAGES WHEN A WHEEL SPEED SENSOR DETECTS IMPENDING WHEEL LOCK-UP, ALLOWING THE VEHICLE TO BE STEERED WHILE HELPING MAINTAIN VEHICLE STABILITY (SEE PAGE 6, CURRICULUM; INSIDE COLUMN 4, PAMPHLET)].

What is the idea behind 4-wheel anti-lock brakes?

[4-wheel is designed to prevent skidding and maintain limited steering control during emergency braking (see page 7, Curriculum; Cover, Pamphlet)].

Name two ways that the anti-lock brake system can be deactivated by the driver.

### **Unit ABS Topic Evaluation**

[By removing the hard pressure from the brake pedal or by pumping the brakes (Inside Column 1, Pamphlet)].

What sensations will a driver feel when ABS engages?

[Brakes may feel harder to push, have a vibration, or noises may occur (see page 11, Curriculum; Inside Column 1, Pamphlet)].

What effect does road surface have on stopping distance with ABS?

[Stopping distance may be longer on some dry surfaces and limited traction surfaces, such as freshly fallen snow or loose gravel, but the ability to steer the vehicle remains (see page 7, Curriculum; Inside Column 1-2, Pamphlet)].

What is the difference using 2-wheel ABS?

[2-wheel ABS, found only on light trucks, is designed to eliminate rear wheel skid which may produce a loss of vehicle stability such as a sudden movement to the right or left. The front wheels may still lock up. The driver must recognize that although the vehicle has 2-wheel ABS on the rear wheels, he/she must use conventional braking techniques with this 2-wheel anti-lock brake system (see Inside Column 4, Pamphlet)].

How do you know that your vehicle is equipped with ABS?

[There may be a marking on the vehicle, but ABS-equipped cars have a dashboard alert system that lights briefly at start-up (Inside Column 1-2, Pamphlet)].

List four things one should do with ABS.

[Add to your following time or distance interval in poor weather as with conventional brakes, practice using ABS, keep your foot firmly on brake, and check the owner's manual for special concerns (see Transparency ABS-4, p. 24; Inside Column 2, Pamphlet)].

• List four things one should not do with ABS.

[Don't drive more aggressively, don't pump the brakes, don't forget to steer after checking for clearance, and don't be alarmed by noise and vibration which may occur (see Transparency ABS-5, p. 25; Inside Column 3, Pamphlet)].

### WORKSHEET ABS-A "ABS CONCERNS AND ISSUES"



### Class Activity 1-1 DRIVING UNDER ADVERSE CONDITIONS

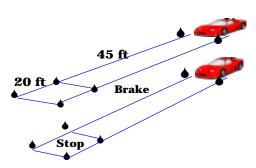
Na	me Date		
Brak	Answer the following questions to the best of your ability using the "America Brakes for Safety" illustrated pamphlet provided by the ABS Education Alliance.		
•	What does the abbreviation "ABS" stand for?		
•	What is the difference between ABS and conventional automobile brakes?		
•	What is the idea behind 4-wheel anti-lock brakes?		
•	Name two ways that the anti-lock brake system can be deactivated by the driver.		
•	What sensations will a driver feel when ABS engages?		
•	What effect does road surface have on stopping distance with ABS?		
•	What is the difference using 2-wheel ABS?		
•	How do you know that your vehicle is equipped with ABS?		
•	List four things one should do with ABS.		
•	List four things one should <b>not</b> do with ABS.		

### "BRAKING AND STEERING TECHNIQUES INSTRUCTION"

Performance Skill Activity 1-1. Squeeze Braking, Limited Steering, and ABS

### PERFORMANCE ACTIVITIES

**Exercise A. Squeeze Braking and ABS Skills** 

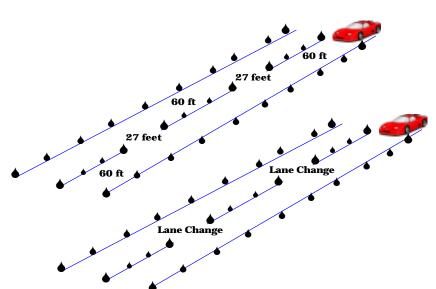


**Exercise**. Set up an exercise that would allow 45 feet of braking distance and 20 feet to stop within a box. Enter the exercise at 40 mph and use a controlled braking effort to stop. Second effort use 40 to 45 mph and a threshold brake to stop the vehicle. Third effort use 40 to 45 mph and activate the ABS system to stop the vehicle. If an ABS-equipped vehicle is not available, try using brake lock at 40 to 45 mph to illustrate the differences in the braking skill stopping distances.

Instructor Activities. Demonstrate two squeeze braking techniques, controlled and threshold, to the students prior to having students perform any task. The goals are to enhance squeeze braking skills and demonstrate the activation of the anti-lock brake system. Controlled braking is defined as maintaining firm brake pressure while keeping the heel of your foot on floorboard to stabilize braking actions. Threshold braking is applying the maximum squeeze braking pressure that does not produce a traction loss. ABS will automatically engage when full maximum brake pressure is applied and maintained on brake pedal. Speeds may be started at 30 mph with limited experience drivers.

### **Exercise B. Limiting Steering Skills**

**Exercise.** Set up an exercise that would allow 60 feet between lane changing



efforts and 27 feet of space to change lane position. Try first entry using too much steering input like hand-over-hand to notice the changes in vehicle balance caused by excessive steering. Second effort use evasive action steering with limited steering inputs for vehicle balance during the lane change. Visually targeting the open lane is critical prior to any steering movement. This exercise may be accomplished with a shuffle steering effort

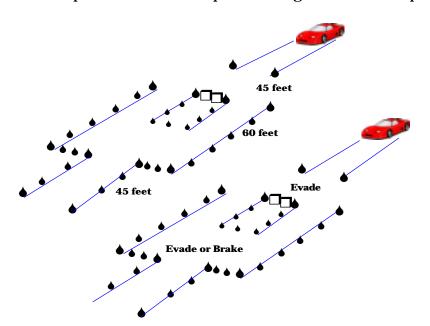
but may not be as efficient in moving the vehicle to the center of each 10 or 12 foot lane. This exercise may be used in reverse to understand vehicle balance and one hand steering inputs. Backing speeds must be reduced to allow time for visual targeting skills and limiting steering inputs to change lanes as needed.

**Instructor Activities.** Demonstrate the effects of limited steering inputs that

allow the vehicle to move exactly where the driver wants it to go. Exaggerate a hand-over-hand maneuver or how too much steering input rapidly changes car balance and allows the vehicle to lose traction or skid. Demonstrate the need for speed reduction and limited steering when traveling in reverse or on limited traction surfaces. Emphasize the need to establish a target area to develop a good sightline before steering the vehicle. Several evasive steering techniques are used from full 180 degree inputs to more limiting slide or shuffle steering techniques. The instructor should use either technique to demonstrate the effects of steering on balance and lane position. This will lead into teaching the real benefit of ABS, as limited steering techniques may be used while ABS is activated.

### **Exercise C. Braking and Steering Skills**

**Exercise.** Set up an exercise which allows for space to change lanes in avoidance of a stationary object. On initial entry, the student should use only evasive steering efforts at speeds under 30 mph. During second attempt, increase speed and add a



threshold brake after the first steer to stop at the second blocked area. On third attempt, increase speed to 40 mph and activate ABS while using an evasive steer to slow and evade the problem areas. Emphasize the importance of finding a safe lane position and how limiting steering inputs are critical when avoiding a problem area.

Instructor Activities.

Demonstrate the effects of combining the braking and steering techniques. Using conventional brakes,

great care is needed not to employ brakes and steering at the same time due to immediate traction loss. ABS allows the driver to avoid hazards while maintaining full brake pressure. Care is needed to recognize that a safe and open area must be determined prior to steering the vehicle. The driver must recognize the surrounding traffic conditions and respond with conventional squeeze braking and limited steering techniques to avoid a problem. Full braking pressure must be maintained when ABS is activated.

### **INSTRUCTOR PRECAUTIONS**

Each exercise should be demonstrated by the instructor prior to any student efforts. Exercises should be free from obstructions and crossing vehicular traffic during operation of the skill development session. An off-street parking area is required for safe development of the performance skills required. Student errors may produce traction losses and the instructor must be prepared to take corrective verbal, braking, or steering measures.